

UNITED STATES PATENT APPLICATION

OF

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FOR

WEARABLE COOLER USING THERMOELECTRIC MUDULE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Application No. P2003-44602, filed on July 02, 2003, which is hereby incorporated by reference as if fully set forth herein.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a wearable cooler, and more particularly, to a wearable cooler using a thermoelectric module.

Discussion of the Related Art

[0003] In general, clothes have a protective function for protecting a body from outside environment. However, it is required that modern clothes have not only a protective function but also a fashion function for satisfying aesthetic desire of a human being and a practical function for more convenient life of a human being.

[0004] As an example of the clothes having a practical function, there are clothes providing a pleasant feeling for a wearer at a high temperature in summer and a warm feeling at a low temperature in winter. The clothes with the function are described in FIG. 1.

[0005] Referring to FIG. 1, a plurality of packs with a phase change material is adhered to an inside of the clothes. The pack provides a cool feeling or a warm feeling in direct or indirect contact with the body.

[0006] However, there is a problem that the phase change material is not used for a long time and a performance is lowered as time goes by. There is another problem that the wearer feels discomfort because of humidity increased in a part of the pack being in contact with the body, and only the part of the body being in contact with the pack is cooled or warmed. Also, the phase change material is heavy and the wearer feels burden.

[0007] Therefore, it is required to develop the clothes, which maintains cooling and warming functions for a long time and a performance thereof is not fallen as times goes by.

SUMMARY OF THE INVENTION

[0008] Accordingly, the present invention is directed to a wearable cooler that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0009] An object of the present invention is to provide a wearable cooler, which maintains cooling and warming functions for a long time and performance of the wearable cooler is not fallen as times goes by.

[0010] Another object of the present invention is to provide a wearable cooler, which provides pleasant feeling for a wearer all the time.

[0011] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0012] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a wearable cooler includes a thermoelectric module provided on clothes for absorbing and discharging heat according to an electric current, at least one first heat sink provided at a first side of the thermoelectric module, at least one second heat sink provided at an opposite side of the first heat sink on the basis of the thermoelectric module, at least one first fan provided at an opposite side of the thermoelectric module on the basis of the first heat sink for blowing air to the first heat sink, and an external

case surrounding outsides of the first heat sink and the first fan, and having at least one air inlet and at least one air outlet.

[0013] In another aspect of the present invention, a wearable cooler includes a thermoelectric module provided on clothes for absorbing and discharging heat according to an electric current; at least one first heat sink provided at a first side of the thermoelectric module and at an outside of the wearable cooler; at least one second heat sink provided at an opposite side of the first heat sink on the basis of the thermoelectric module; at least one first fan provided at an opposite side of the thermoelectric module on the basis of the first heat sink for blowing air to the first heat sink and including an axial flow fan; and at least one second fan being provided at an opposite side of the thermoelectric module for blowing air to the second heat sink on the basis of the second heat sink and including a centrifugal fan; and an external case surrounding outsides of the first heat sink and the first fan and having at least one air inlet being corresponded to the first fan and at least one air outlet being adjustable to change the direction according to a user need.

[0014] The wearable cooler further includes a contact guard having an opening being corresponded to the second fan at a skin side opposite to the thermoelectric module. The contact guard includes a projection on a surface being in contact with the second heat sink for maintaining a predetermined distance from the contact guard 600.

[0015] The wearable cooler is in contact with a first side of the second heat sink and a part of the wearable cooler being in contact with the second heat sink includes gauze.

[0016] The wearable cooler composed as aforementioned maintains cooling and warming functions and performance for a long time and provides a pleasant feeling for a wearer all the time.

[0017] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings;

[0019] FIG. 1 is a diagram showing conventional clothes with a phase change material.

[0020] FIG. 2 is a rough diagram showing a cooling and warming portion of wearable cooler according to the present invention.

[0021] FIG. 3 is a rough diagram showing an air movement at a first heat sink provided in the present invention.

[0022] FIG. 4 is a diagram showing an air movement at a second heat sink provided in the present invention.

[0023] FIG. 5 is a diagram showing an embodiment at a state that the present invention is applied to a human body.

[0024] FIG. 6 is a diagram showing an embodiment at a state that the present invention is applied to a human body.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0026] A function of clothes will be described to help understand the present invention. In general, although clothes function to protect a body from outside environment, there are clothes not only with a protective function but also with a fashion function satisfying aesthetic desire of human being and a practical function in modern times.

[0027] As an embodiment of the clothes with the practical function, there is a wearable cooler providing a cool feeling for a wearer at high temperature in summer, and a warm feeling at low temperature in winter.

[0028] The present invention is the wearable cooler with cooling and warming functions. Hereinafter, the embodiment of the clothes with the practical function according to the present invention will be described referring to FIG 2, FIG 3 and FIG 4.

[0029] FIG 2 is a diagram showing cooling and warming portion including a thermoelectric module 200, at least one first heat sink 300, at least one second heat sink 400, at least one fan 310 for blowing air to the first heat sink.

[0030] The thermoelectric module 200 is a unit for absorbing heat and discharging heat according to an electric current. Described in more detail, heat is discharged from a first side of the thermoelectric module 200 and absorbed from a second side of the thermoelectric module when the electric current flows to the thermoelectric module 200.

[0031] When the passage of the electric current is changed, heat is discharged from the second side of the thermoelectric module 200 and absorbed on the first side of the thermoelectric module 200.

[0032] It is desirable that the first heat sink 300 is provided on a first side of the thermoelectric module 200 and in contact with an insulator provided in the thermoelectric module, and, in this case, the first heat sink 300 is provided at outside of the clothes.

[0033] The first fan 310 provided at an opposite side of the thermoelectric module 200 on the basis of the first heat sink 300 blows air to the first heat sink. In this case, it is desirable that the first fan 310 includes an axial flow fan or a centrifugal fan, and a motor as a single body for minimizing a product size.

[0034] The first fan 310 functions to smoothly exchange heat between the thermoelectric module 200 and the first heat sink 300. Although it is not illustrated, if the first fan 310 includes the centrifugal fan, it is desirable that a space with a predetermined size is provided in the center of the centrifugal fan and the centrifugal fan are provided therein for heat exchange such that the first heat sink includes the centrifugal fan.

[0035] The second heat sink 400 is provided at an outer side of the thermoelectric module 200, in more detail, at the opposite side of the first heat sink on the basis of the thermoelectric module 200. Therefore, the second heat sink 400 is provided at a skin side opposite to the first heat sink 300 so as to exchange heat with the thermoelectric module 200.

[0036] In addition to such composition, it is desirable that the wearable cooler further includes an external case 500 surrounding the first heat sink 300 and the first fan 310. The

external case 500 includes at least one air inlet 510 and at least one air outlet 520. It is desirable that the air inlet 510 is corresponded to the first fan 310.

[0037] The air outlet 520 is a passage for discharging air to outside after air is sucked from outside by the first fan 310 and heat is exchanged with the first heat sink 300. The air outlet 520 is provided in all directions of the external case 500. FIG. 3, 5 and 6 are diagrams showing such composition.

[0038] However, the composition is only an embodiment of the present invention. The air outlet 520 can be provided in a direction of the external case 500 or in three directions thereof. Desirably, any composition can be selected as long as air is discharged the best thereof. In addition to this, it is better that the direction of the air outlet 520 is controllable in accordance with the need of a user.

[0039] It is desirable that the present invention with such composition further includes a second fan 410 provided at the opposite side, i.e., at the skin side of the thermoelectric module 200 on the basis of the second heat sink for blowing air to the second heat sink 400.

[0040] At this time, it is desirable that a side of the clothes is provided between the second fan 410 and the skin. More desirably, fabric in the place of the fan includes gauze.

[0041] It is obvious that the side of the clothes is not necessarily provided between the fan and the skin. In other words, any composition allowing that the second fan 410 absorbs air from the skin side can be selected.

[0042] The second fan 410 absorbs air from the skin side and discharges to the second heat sink 400. In more detail, when the second fan 410 absorbs air containing heat generated from the skin and discharges to the second heat sink, the thermoelectric module 200 exchanges heat with air through the medium of the second heat sink 400 and discharges air to the skin side or to outside.

[0043] The second fan 410 includes an axial flow fan or a centrifugal fan for an aforementioned action. It is desirable that the second fan 410 and the motor are formed as a single body for minimizing the product size.

[0044] When the second fan 410 includes the centrifugal fan, it is desirable that the second heat sink includes a space with a predetermined size in the center thereof so as to have the centrifugal fan for heat exchange. It is the same in case the second fan 410 includes the axial flow fan.

[0045] The aforementioned composition helps reduce the height of all, and thus minimize the produce size. In addition to the aforementioned composition, it is desirable that the

wearable cooler further includes a contact guard 600 surrounding the first heat sink 300 and the first fan 310.

[0046] It is desirable that the second heat sink 400 includes a projection 420 on a surface in contact with the contact guard 600 to maintain a predetermined distance from the contact guard 600. The projection 420 can be provided on a side of the contact guard 600. Air flows more smoothly when the predetermined space is provided between the contact guard 600 and the second heat sink 400.

[0047] The present invention includes the thermoelectric module 200, the first fan 310, the second fan 410 and a power supplier 700. The power supplier includes a chargeable battery or a disposable battery.

[0048] Also, it is desirable that the present invention further includes an electric-current controller 800 for cooling or warming by changing an electric current being supplied to the thermoelectric module 200 according to an outside temperature. In this case, the current controller controls the electric current being supplied to the thermoelectric module 200 for temperature control.

[0049] Of course, the wearable cooler of the present invention further includes a temperature censor (not illustrated) for censoring a temperature of outside air. The electric-

current controller 800 controls the electric current for maintaining a proper temperature according to the outside temperature being censored by the temperature sensor.

[0050] A process of use of the wearable cooler being composed as aforementioned according to the preferred embodiment of the present invention will be described as follows. First, when the power is supplied from the power supplier, an electric current is sent into the thermoelectric module 200, the first fan 310 and the second fan 410.

[0051] Accordingly, heat is generated from a side of the thermoelectric module 200 being in contact with the first heat sink and is absorbed from a side of the thermoelectric module 200 being in contact with the second heat sink 400.

[0052] Air is sucked from the air inlet 510 by the first fan for absorbing heat generated from the thermoelectric module 200 through the medium of the first heat sink 300 and is discharged to outside through the air outlet 520.

[0053] Meanwhile, air being sucked from the skin side by the second fan 410 is cooled after discharging heat to the thermoelectric module 200 through the medium of the second heat sink 400 and is discharged directly or indirectly to the skin side along the side of the clothes.

[0054] In an opposite way of the process, at a low temperature in winter, the electric current is sent in an opposite direction to that in summer. The thermoelectric module 200

absorbs heat from a side being in contact with the first heat sink 300 and discharges heat from a side being in contact with the second heat sink 400.

[0055] An effect of the present invention being composed as aforementioned is summarized as follows. First, there is no need to exchange the phase change material after using for a predetermined time as the wearable cooler using the phase change material according to the present invention.

[0056] Second, the function is maintained for a long time and user satisfaction is high according to the present invention.

[0057] Third, temperature is adjusted to set for the user according to the outside temperature according to the present invention.

[0058] Four, heat generated from the skin is smoothly discharged to outside and more pleasant feeling on the skin is created according to the present invention.

[0059] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.